CLAIMS

I CLAIM:

1. An electric discharge narrow band gas laser with minimized wavelength variations caused by fluctuations in laser gas density resulting in laser beam directional changes comprising:

A) a laser chamber,

B) an elongated electrode structure enclosed within said chamber comprising an elongated anode and an elongated cathode separated by a distance defining a discharge region, said discharge region defining a long dimension in a beam direction,

C) a laser gas contained in said chamber,

D) a fan for circulating said laser gas within said chamber and through said discharge region,

E) an output coupler and a line narrowing module defining a resonant cavity and laser beam direction, and

F) two chamber windows having surfaces oriented substantially parallel to the surfaces of each other and at an angle between 40^{o} and 70^{o} with said beam direction,

G) a fast beam deflection monitoring means to monitor deflection of said test laser beam.

2. A laser as in Claim 1 wherein said angle is approximately equal to Brewster's angle for the laser gas and window materials.

3. A laser as in Claim 1 wherein said angle is about 45^{o}.

4. A narrow band electric discharge gas laser with minimized wavelength variations caused by fluctuations in laser gas density resulting in laser beam directional changes comprising:

A) a laser chamber,

B) an elongated electrode structure enclosed within said chamber comprising an elongated anode and an elongated cathode separated by a distance defining a discharge region in which a discharge laser beam is amplified, said discharge region defining a long dimension in a beam direction,

C) a laser gas contained in said chamber,

D) a fan for circulating said laser gas within said chamber and through said discharge region,

E) an output coupler,

F) a grating based line narrowing module comprising a grating and a tuning means to control direction of illumination of light from said chamber on said grating, said direction of illumination defining an illumination direction,

G) a test laser producing a test laser beam directed along a path through said discharge region and into said line narrowing module and reflecting at least once off said grating,

H) a fast beam deflection monitoring means to monitor deflection of said test laser beam; and

I) a feedback control means for controlling said tuning means based on signals from said beam deflection monitoring means.

5. A laser as in Claim 4 wherein said tuning means is a pivoting mirror.

6. A laser as in Claim 4 wherein said beam deflection monitoring means comprises a knife edge blocking a portion of a sample of said test laser beam and a detector for monitoring intensity of said sampled portion downstream of said knife edge.

7. A laser as in Claim 4 wherein said beam deflection monitoring means comprises a quadrant detector.

8. A laser as in Claim 4 and further comprising a pulse energy control means for minimizing pulse energy fluctuations caused by discharge laser beam fluctuations in a vertical direction.

9. A laser as in Claim 8 wherein said tuning mirror is configured to pivot about each of two axis and said feedback control means is configured to control degrees of pivot about both axis based on signals from said beam deflection monitoring means.

10. A laser as in Claim 4 wherein said feedback control means is configured to pretune said discharge laser prior to beginning of lasing operation.

11. A laser as in Claim 4 wherein said feedback control means is configured to correct for wavelength drift during idle periods of said discharge laser.

12. A technique for measuring effects of changes in beam deflection in a narrow band gas discharge laser defining a discharge region comprising the steps of:

A) directing a test laser beam through said discharge region;

B) blocking a portion of said test laser beam downstream of said discharge region with a knife edge; and

C) monitoring a non-blocked portion of the beam to determine changes in beam direction caused by deflections of the beam in the discharge region.

13. A technique for providing active feedback control of laser beam directional fluctuations in a narrow band gas discharge laser system having a grating based line narrowing unit and defining a gas discharge region and a discharge laser beam path through said discharge region and into and out of said line narrowing unit comprising the steps of:

A) directing a test laser beam through said discharge region and said line narrowing unit along a path at least partly co-aligned with said discharge laser beam path;

B) directing a portion of said test laser beam to a deflection detector to produce a signal to monitor deflection of said test laser beam; and

C) using said signal in a feedback loop to provide rapid control wavelengths of said narrow band gas discharge laser system in order to minimize fluctuations in wavelength due to beam directional fluctuations, pretune the laser and/or to correct for wavelength drift.